



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,513	03/10/2004	Brian S. Higgins	7340-011	4226
4678	7590	06/21/2011		
MACCORD MASON PLLC 300 N. GREENE STREET, SUITE 1600 P. O. BOX 2974 GREENSBORO, NC 27402			EXAMINER	
			SUERETH, SARAH ELIZABETH	
			ART UNIT	PAPER NUMBER
			3749	
			MAIL DATE	DELIVERY MODE
			06/21/2011	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/797,513	HIGGINS, BRIAN S.
	<b>Examiner</b> SARAH SUERETH	Art Unit 3749

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 10 January 2011.  
 2a) This action is FINAL.      2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 17-36 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 17-36 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-1448)  
 3) Information Disclosure Statement(s) (PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_

4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date \_\_\_\_\_

5) Notice of Informal Patent Application  
 6) Other: \_\_\_\_\_

**DETAILED ACTION**

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/10/11 has been entered.

***Claim Rejections - 35 USC § 112***

2. Claims 24,32,35,36 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for using coal with between .8 and 2.85 percent sulfur, does not reasonably provide enablement for the range of "at least about .8%". Also, while there is support for the power plant having a load of either 70MW,154,179, or 182MW, this is not the same scope as "at least about 70MW". The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention commensurate in scope with these claims.

3. Claims 24,32,35,36 are also rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application

was filed, had possession of the claimed invention. As noted above, the claimed ranges are not described in the specification as originally filed.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 24 and 32 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. The claims have been amended to include the limitation "over-fired air provided at a percent, based on total air, chosen from at least one 10% to about 30%".

7. The scope of this limitation is unclear, as it is unclear what the phrase "at least one 10%" is intended to encompass. For examination purposes, the claim was regarded to recite that between 10 and 30% of the total air is used in this step.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. **Claims 17-36** are rejected under 35 U.S.C. 103(a) as being unpatentable over **U.S. Patent No. 4,375,949 to Salooja** ("Salooja") in view of **U.S. Patent No. 5,039,507 to Sturm** ("Sturm") and **U.S. Patent No. 4,029,752 to Cahn** ("Cahn"), and further in view of **U.S. Patent No. 4,196,057 to May** ("May") (previously cited), **Altman (5,011,516)**, and applicant's admitted prior art.

Salooja discloses in the specification and figures 1-10 an invention in the same field of endeavor as applicant's invention and similar to that described in applicant's claims 17-36.

In particular, in regard to at least claim 17, Salooja discloses a method of reducing the acidity (each of nitrogen oxides and sulfur trioxides, see cols. 5-7) comprising the steps of:

partially combusting the fuel in a first stage to create a reducing environment in situ (see at least col. 1, lines 50-54);

maintaining the reducing environment for a sufficient time period such that reducible acids are reduced to a predetermined level to achieve a desirable acidity concentration in the flue gas (see at least col. 1, lines 54-59 and col. 7 lines 5-20 describing that the nitrogen oxides and sulfur tri-oxides are controlled to desired/predetermined levels);

combusting the remainder of the fuel and combustion intermediates in a second stage with oxidizing environment; thereby decreased the acidity of the flue gas by reducing the acid concentration of the gas (see at least col. 1, lines 60-63 and lines 29-33).

In regard to the limitation that the fuel is coal, Salooja discloses that the fuel may be a hydrocarbon or carbonaceous fuel. Applicant has submitted an affidavit and remarks indicating they believe Salooja to disclose a liquid fuel oil instead of coal.

10. In response, the examiner cites Sturm. Sturm teaches that a power plant can operate using either coal or carbon fuel oils (col. 1 lines 14-15). Sturm's disclosure of a power plant is regarded to suggest the method step of "obtaining" a power plant.

Regarding claims 24,32,35,36, Sturm discloses that coal of approximately 1% sulfur can generate 600MW of power (col. 1 lines 20-25).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to operate the Salooja apparatus with coal as a fuel, as either hydrocarbon or carbonaceous fuel can be used as art recognized equivalents (col. 1 lines 14-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the Salooja method steps to treat the effluent from a conventional power plant described by Sturm, in order to remove harmful pollutants from the exhaust stream (col. 1, lines 25-30).

In regard to the limitation the reducible acids are reduced "by electron addition", while Salooja does disclose that the nitrogen oxides and sulfur trioxides are reduced, the reference does not appear to go into further detail as to the mechanisms of the chemical reduction, namely "by electron addition."

Cahn teaches a method of reducing sulfur oxides that is considered to be in the same field of endeavor as both applicant's invention and Salooja. Cahn describes that

sulfur oxides in a process gas stream are reduced by reaction with ammonia (i.e. NH<sub>3</sub>) as a reducing agent (see at least col. 7, lines 48-52). Cahn clearly provides that sulfur trioxide is reduced in the same manner as the described processes for sulfur dioxide (see at least col. 7, lines 34-38). The examiner notes that at least ammonia (NH<sub>3</sub>) is considered to be the type of reducing radical described in applicant's specification (see specification p. 9, line 14 lists NH<sub>i</sub>). Further, the examiner also notes that Cahn also suggests that other reducing agents such as H<sub>2</sub>, CO, and CH<sub>4</sub> (also listed in applicant's specification) are recognized in the art as reducing radicals creating a reducing environment (see Cahn, col. 7, lines 65-68). This describes process of employing either ammonia or other above noted agent to result in the reduction of sulfur trioxide (a reducible acid) is considered to suggest the reduction by electron addition described in applicant's specification and claimed in claim 17.

Returning to Salooja, while this reference provides only some detail of the reducing of sulfur trioxides through the practice of the described method, there is clear suggestion that the reduction of sulfur trioxides is recognized in the art. Accordingly, a person of ordinary skill in the art at the time the invention was made would desirably modify the process in Salooja to incorporate the reduction by electron addition suggested by Cahn to desirably produce a gas stream that has "little or no" sulfur trioxide (see at least Cahn, col. 8, lines 41-46).

Salooja and Cahn teach substantially all of the limitations of the methods recited in claims 17-23 and 25-31, with exception of the steps of adjusting the reducing environment to lower the flue acid gas dewpoint (claims 17 and 23), improving ESP

function (claims 17 and 25), and measuring acid dewpoint (claim 23). These additional steps have not been identified in Salooja or Cahn.

However, in regard to claims 17 and 25, the acid of concentration of the flue gas is directly related to the acid dew point temperature of the flue gas. This is expressly noted by applicant in applicant's description of the prior art, namely "...as the SO<sub>3</sub> concentration increases, the acid dew point temperature of the flue gas increases." (see applicant's specification, p. 1, lines 16-18). To further support this assertion the examiner also points to May. May discloses a method which provides that "[m]easurement of dew point enables a semi-quantitative determination of the sulfur trioxide concentration in the exhaust or flue gas" (see May, col. 5, lines 30-32 and 38-42). Accordingly, a person of ordinary skill in the art would understand that reduction of the acid concentration of the flue gas necessarily results in the lowering of the acid dew point level of the flue gas. As noted above, Salooja provides for the reduction of sulfur oxides from the effluent of flue gas of a furnace to a desired level (see at least col. 1, lines 54-59 and cols. 5-7). Therefore, a person of ordinary skill in the art would reasonably understand that obtaining the reduction target of the oxides in the flue gas as specified in Salooja would necessarily result in a corresponding desired dew point level (again see at least May, col. 5, lines 38-42).

Also in regard to claims 17 and 25, it is unclear whether the Salooja apparatus includes an ESP device. However, Altman teaches that fly ash is conventionally removed from combustion gases by electrostatic precipitation (col. 1, lines 7-10).

Altman also teaches that the concentration of sulfur trioxide must be controlled to optimize the performance of the ESP filter (col. 1, lines 17-21).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Salooja apparatus to include the ESP device, as Altman teaches they are conventionally used to control fly ash (col. 1, lines 7-10).

Accordingly, a person of ordinary skill in the art would understand that reduction of the acid concentration of the flue gas necessarily results in optimizing the performance of an ESP device. As noted above, Salooja provides for the reduction of sulfur oxides from the effluent of flue gas of a furnace to a desired level (see at least col. 1, lines 54-59 and cols. 5-7). Therefore, a person of ordinary skill in the art would reasonably understand that obtaining the reduction target of the oxides in the flue gas as specified in Salooja would necessarily result in a corresponding improved performance of the ESP device (again see at least Altman, col. 1, lines 17-21).

In regard to at least claim 18 and 19, Salooja describes that a catalytic burner is supplied at least in the first stage that produces lower NOx production than conventional combustion systems (see at least col. 2, lines 7-12, col. 6, line 67 through col. 7, line 4 and col. 4, lines 31-47) and thus reasonably suggests micro-staging through the use of low-NOx burners.

In further regard to claims 18 and 19, as noted above, while the examiner considers that the operation of the catalytic burners suggests the recited micro-staging using low NOX burners, even if this is not a proper understanding, the examiner notes that applicant admits that the use of micro-staging using low-NOx burners to reduce

emissions in combustion furnaces is known in the art (see admitted prior art of page 5, lines 4-18 of applications' specification). Accordingly, even if the operation of the catalytic burners of Salooja are not properly considered to be applicant's recited micro-staging using low NOx burners, a person of ordinary skill in the art would desirably seek to incorporate micro-staging using low NOx burners in the process of Salooja in order to desirably aid in reducing NOx emissions (see admitted prior art of p. 5, lines 4-18 of applications' specification).

In regard to at least claims 20-24 and 26-31, applicant also admits that the use of macro-staging using over-fired air and used in combination with micro-staging using low NOx burners is known in the art (see admitted prior art of page 5, line 19 through page 6, line 5 of applications' specification).

Accordingly, a person of ordinary skill in the art would seek to employ macro-staging using over-fired air in a combustion stage and/or in combination of micro-staging using low NOx burners to desirably achieve NOx emissions reduction (see admitted prior art of page 5, line 19 through page 6, line 5 of applications' specification).

Regarding claims 24 and 32, applicant's admitted prior art also includes the admission that prior art micro-staging included injecting a portion of the total air flow as a primary air stream, and a portion as a secondary air stream (see page 5 lines 4-10). However, the ratio of primary to secondary air is not disclosed.

Applicant has not demonstrated criticality for the claimed range, nor shown unexpected results resulting from the claimed range. Generally, differences in concentration or temperature will not support the patentability of subject matter

encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955), Also see MPEP 2144.05).

Regarding claim 24, Salooja teaches burning a “carbonaceous fuel”, which is considered to suggest coal.

Regarding claims 33 and 34, Salooja teaches reducing the concentration of sulfur trioxide to 18 ppm (col. 7, line 17).

In regard to claim 25, this claim includes limitations similar to that of claim 17 with the additional method step of “measuring the acid dewpoint of the flue gas.” Salooja possibly does not expressly disclose actively measuring the acid dewpoint of the flue gas.

However, May, as previously noted, clearly provides that the dew point of the exhaust gas is measured to determine a concentration of sulfur trioxide (see May, col. 5, lines 30-32). Further, May provides that the measurement of the dew point also allows for determination of “cold end” corrosion locations (May, col. 5, lines 32-34) and further that the inherent corrosion rate measurement that arises from the dewpoint measurement “indicates the degree of inhibition of an additive such as magnesium and the actual condition at the surface.” (May, col. 5, lines 34-37).

Accordingly, a person of ordinary skill in the art would desirably modify the method of Salooja to incorporate measuring the acid dewpoint of the flue gas as taught in May to determine the level of corrosion that results from the additives in the flue gas (see May, col. 5, lines 30-37).

***Response to Arguments***

11. Applicant's arguments with respect to claims 17-34 have been considered but are not persuasive.
12. Regarding the 112 rejection, applicant argues that there is an inherent upper limit to the amount of sulfur allowable in the coal, and an inherent upper loading limit for the power plant. Applicant asserts that the invention would be able to operate with greater than the disclosed values. However, the claimed ranges were not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The examiner could not find support in the specification for extending the ranges beyond the stated values.
13. In response to applicant's argument that Salooja's combustion chamber would not work with the power plant disclosed by Sturm, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

14. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the way that the sulfur trioxide is reduced) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

***Conclusion***

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SARAH SUERETH whose telephone number is (571)272-9061. The examiner can normally be reached on Mondays through Friday 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven McAllister, can be reached (571) 272-6785. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sarah Suereth/  
Examiner, Art Unit 3749

/STEVEN B. MCALLISTER/  
Supervisory Patent Examiner, Art Unit 3749